

**Rheem
Air Conditioning
Division**



5600 Old Greenwood Rd. (72908)
Fort Smith, AR 72917
479/646-4311 phone
479/648-4666 fax

December 1, 2006

Mr. Joseph Cassmassi
Planning, Rule Development and Area Sources
SCAQMD
21865 Copley Drive
Diamond Bar, CA 91765

Re: SCAQMD Draft Air Quality Management Plan: Comments on proposed Control Measure No. 2007 CMB-03 ("Further NOx Reductions from Space Heaters – Natural Gas Fired Fan-Type Central Furnaces")

Dear Mr. Cassmassi:

Rheem Manufacturing Company ("Rheem") is a privately held manufacturing company that began operation in 1927 as a supplier of packaging to the petroleum industry. In the 1930's Rheem began manufacturing water heaters, and in 1947 began manufacturing warm air furnaces. In 1959, the company acquired Ruud Manufacturing Company, a pioneer in the industry with a well-regarded product line and a distribution network throughout North America. In subsequent years, Rheem entered the heating and air conditioning market and expanded in the late 1960's and 1970's with the rapid growth of the central air conditioning industry.

Today, Rheem is a leading North American producer of water heaters, central warm air furnaces and air conditioners, swimming pool heaters and commercial boilers. The company's products are used for residential and commercial applications and operate on a variety of fuels. Our gas and oil furnaces are all designed and manufactured within the U.S. predominately for the North American market. We currently supply residential furnaces and package gas/electric units (a.k.a. rooftops) to our customers in the South Coast Air Quality Management District ("SCAQMD" or "District"). We have supplied safe and reliable products to the SCAQMD for many years that meet the current Rule 1111 emissions compliance limit of 40 nanograms per Joule ("ng/J").

Industry shipments of natural gas furnaces into the District total approximately 200,000 units each year. In the case of Rheem and most other Original Equipment Manufacturers, (a.k.a. OEMs), furnaces are sold to local distributors who sell to dealers (a.k.a contractors).

The local, professional dealers install the furnaces in consumer's homes. Rheem is one of five major manufacturers' who currently supply over 80% of the District furnace market.

Regarding proposed Control Measure No. 2007 CMB-03 for natural gas fired fan-type central furnaces ("Control Measure"), Rheem is concerned about the proposed extreme 65% reduction in allowed NO_x level from 40 to 14 ng/J output and the unrealistic time schedule, i.e., by 2011. Specifically, we are concerned about the technical feasibility of the Control Measure, and the District's technical justification for the proposed reduction.

The District's assumption stated in the Control Measure that "emission reductions of 50% to 75% are possible from this source category" is incorrect. In the proposed Control Measure, the District states that "central furnaces will likely require the use of power premix burners in the higher heat input range, and atmospheric premix burners in the lower heat input range." Rheem and other major manufacturers do not currently use power or atmospheric premix burners in our designs. Today's high efficiency furnace technology utilizes an in-shot burner and an induced draft blower. These burners provide a premix of primary air with the fuel and induce excess secondary air to provide complete combustion. This induced draft configuration maintains a negative pressure within the heat exchanger. The negative pressure assures that no flue gas containing poisonous carbon monoxide gas can leak into the circulating air stream. Power burner technology as proposed by the District is unproven and may not provide the same level of protection to people in their homes and conditioned space.

In a furnace, the heat exchanger is in direct contact with the air that circulates within the home. The heat exchanger contains poisonous carbon monoxide gas. Today the system operates safely because if there is a leak in the heat exchanger caused by stress fatigue cracking or corrosion of the heat exchanger, the induced draft blower sucks the circulating air into the heat exchanger and pumps it outside along with the carbon monoxide gas and other products of combustion.

Conversely, the proposed power burner blows air into the heat exchanger. Any leak in the heat exchanger would allow the poisonous carbon monoxide to be injected into the circulating air and poison the inhabitants of the home. To overcome this unacceptably dangerous configuration, an airtight heat exchanger must be developed and tested. In the past, manufacturers have not been willing to rely on an airtight heat exchanger design because of the risk of failure and wide variability of construction and installation practices. The integrity of the heat exchanger is also reliant on the quality of the indoor air. As an example, based on previous field failures, a furnace that is located adjacent to a washing machine may form a leak if the homeowner continually uses an unusual amount of bleach in the laundry. Locating a poorly maintained cat litter box adjacent to the furnace can result in reduced life caused by stress corrosion cracks in the heat exchanger. The application of this design would require significant laboratory and field-testing and even then the pursuant unsafe failure mode may make it unworthy of serious consideration.

The District learned in the recent Rule 1121 product variance proceeding that the development of ultra low NO_x water heaters is far more complicated and time consuming than initially thought, Rule 1121 had been amended in 1999 to impose a 10 ng/J emission limit. It will have taken approximately seven plus years to develop and introduce a 10 ng/J water heater, now expected by late 2007. Furnace technology is even more complex. The heat exchanger is the heart of the furnace system. The heat exchanger forms the protective boundary that restricts mixing of the poisonous carbon monoxide gas and other combustion products with the air circulating within our homes. Currently, Rheem and other manufacturers design and build furnaces that comply with the ANSI Z21.47 Safety Standard and ANSI Z223.1 National Fuel Gas Code. These standards have been developed in recent years for mid and high efficiency furnaces with the current state of induced-draft or atmospheric technology in mind to assure safe and reliable operation. If furnace manufacturers develop appliances that incorporate a new power burner technology, the assumptions made in the safety standards must be reassessed. It is imperative that in our desire to protect the environment outside the home, that we do not pollute the indoor environment, endangering the consumer.

The proposed Control Measure makes certain speculative assumptions about the cost-effectiveness of the burner application to furnaces. Rheem has not applied the proposed power burner to natural gas furnaces due to concerns about safety and reliability. It is a safety requirement that the poisonous flue gas not be allowed to mix with the home's circulating room air. Significant additional time is required to study the technical feasibility of this proposal and determine the costs associated with the safe application of this technology to furnaces, if feasibility can be proven.

Power burner technologies are not readily applicable to current modular, multi-port, tubular and clamshell furnace construction. The proposed power burner design would require a single chamber to contain the burner. This style of furnace is similar to oil furnace designs that are not as compact and use more material because the single chamber does not facilitate heat transfer between the heat exchanger's metal surface and the circulating air. The increased size and material costs would directly affect the price paid by consumers. Home construction costs are also affected as the size of the equipment grows. Contractors have taken advantage of today's compact design to restrict the space allowed for the furnace. Major structural modifications could be required to replace a compact furnace design with the proposed power burner furnace design.

Assuming that furnaces can be redesigned to comply with the 14 ng/j NO_x level, it is highly likely that the resulting appliance will be much more costly and limited in the number of models available. Today, using a special stainless steel insert, every one of Rheem's furnaces can be converted to a low NO_x furnace with NO_x emissions \leq 40 ng/J. This allows consumers in the District the full range of the Rheem furnace offering. The District is not our largest market, but the cost of the 40 ng/J NO_x furnace has been limited to that of an added component. A new specially designed and built furnace will require new tooling and have a market limited to areas with restrictive air quality

requirements. It is highly likely that the cost increase to the homeowner will be very substantial.

Over the years, as the District reduced emission levels allowed in water heaters and boilers, we at the Rheem Air Conditioning Division have monitored the efforts of sister Research and Development groups. We are aware of technologies that are being considered on water heaters and boilers such as radiant burners and power burners. Premix burners are currently used on some boiler and water heater designs, where the systems circulate a fluid and must maintain an airtight seal between the flue gas stream and the fluid. In these applications, if a leak forms, the liquid fluid would escape and warn the consumer that the appliance has failed. Even so, the mixing of the flue gas stream and the fluid would not compromise the safety of the residents.

Furnace manufacturers have not always successfully introduced new technology to the marketplace. The current tubular heat exchanger designs employed in many furnaces have been selected based on proven long term reliability, compared to prior standard clamshell and drum heat exchanger designs. Design failures have occurred in the past when regulations have compressed design cycles and designs were commercialized before they were sufficiently tested. Extreme care in terms of extensive safety and reliability testing will be required during the application of new technology that introduces new risks to the safety of consumers in their homes. Existing technology mitigates risk with designs that fail-safe.

The proposed Control Measure is a “technology forcing” one which anticipates that the 65% reduction to the 14 ng/J NO_x emission level can be achieved by 2011. This assumption is unreasonable. Rheem is currently working to comply with a number of competing regulations concurrent with this proposed rule. In 2010, the EPA will phase out R-22, the refrigerant that we currently use in our air conditioning systems. The phase out of R-22 applies to gas package units that combine gas heat and air conditioning into one system. In 2010, DOE will require a new minimum efficiency for commercial air conditioning equipment with cooling capacity greater than 65,000 btu/hr. In 2016, DOE has proposed the efficiency increase of weatherized equipment increase from 78% to 83% AFUE which results in unacceptable failure due to normal operation. The Department of Energy currently allows manufacturers eight years to comply with new efficiency rules and those must already have been proven to be technologically feasible. We would request that the SCAQMD rule provide an extended period of time for implementation, as manufacturers will be required to evaluate and modify new technology and manufacturing processes and construction methods. In addition it is critical to have adequate time for reliability testing to assure safety and quality. This timing would coincide with the proposed DOE rule that would go into effect in 2016. Any design change would be required to satisfy both requirements.

The Rheem Air Conditioning Division’s Advanced Research and Development group developed a single prototype furnace using stainless steel insert technology that

demonstrated the feasibility of attaining 30 ng/J in a normal manufacturing environment. In our opinion, any requirement beyond this level will require a completely redesigned furnace technology. That technology must be applied to condensing and non-condensing as well as non-weatherized and weatherized equipment

Rheem applauds the progress that has been accomplished through the efforts of the SCAQMD and we consider ourselves a partner in this worthwhile endeavor. Rheem believes that this success will continue if a more feasible emission reduction to 30 ng/J is set in place that promotes safe, reliable, and technologically feasible solutions. The 30 ng/J emission level could be achieved in four years after a final Rule is published. To impose an emission limit below 30 ng/J, manufacturers would require a minimum of 8 years to provide an equally safe and reliable product. Rheem would like to suggest that the SCAQMD assemble a technology review task team to work with Gas Appliance Manufacturer's Association and California gas utilities to develop such a plan. Rheem will participate in this effort to determine a technologically feasible and economically justified control measure.

Sincerely,



Diane M. Jakobs, PhD. PE
Engineering Manager,
Residential Heating Equipment

cc: A. Kessler - Rheem AC Division
K. Meyers - Rheem AC Division
F. Stanonik – GAMA